REMARKS

Claims 16, 18 and 22 to 26 were rejected under 35 U.S.C. §103(a) as being unpatentable over the admitted prior art (APA) in view of Mardon et al. (U.S. 5,735,978) alone or in combination with either one of Graham (U.S. 3,336,201) or Katz (U.S. 3,776,508).

Reconsideration of the application based on the following remarks is respectfully requested.

35 U.S.C. 103(a) Rejections

Claims 16, 18 and 22 to 26 were rejected under 35 U.S.C. §103(a) as being unpatentable over the admitted prior art (APA) in view of Mardon et al. (U.S. 5,735,978) alone or in combination with either one of Graham (U.S. 3,336,201) or Katz (U.S. 3,776,508).

The APA includes the steps of preparing, casting and shaping a zirconium alloy ingot.

Mardon et al. discloses "a method of manufacturing a tube suitable for use as a sheath of a nuclear fuel rod zirconium based alloy." "A drawn blank is subjected to successive passes of metallurgical treatment and of heat treatment." (See Abstract).

Graham discloses "a method for extending the burn-up of nuclear fuel by first utilizing it in one type of reactor and then utilizing it further in another type of reactor." (Col. 1, lines 9 to 13).

Katz discloses a "method of hydriding uranium-zirconium alloy by heating the alloy in a vacuum, introducing hydrogen and maintaining an elevated temperature until occurrence of the beta-delta phase transformation and isobarically cooling the composition." (See Abstract).

Claim 16 recites "a method of fabricating a flat product of zirconium alloy, comprising:

one of preparing and casting a zirconium alloy ingot containing at least 95% by weight of zirconium, and including impurities and alloying elements;

shaping the ingot in order to obtain a flat arrangement;

subjecting the flat arrangement to a β quenching operation under conditions that are determined to obtain within the flat arrangement an acicular structure at an end of the β

quenching;

subjecting the flat arrangement, after the β quenching, to a rolling operation performed in a single rolling sequence without intermediate annealing, the rolling performed at a temperature lying in a range ambient to 200°C, with a reduction ratio lying in a range 2% to 20%; and

subjecting the rolled flat arrangement to an annealing treatment in the α range or in out of an α + β range, performed in a temperature range 500°C to 800°C for 2 min to 10 h."

APA admittedly does not show the "subjecting the flat arrangement, after the β quenching, to a rolling operation performed in a single rolling sequence without intermediate annealing, the rolling performed at a temperature lying in a range ambient to 200°C, with a reduction ratio lying in a range 2% to 20%," and "subjecting the rolled flat arrangement to an annealing treatment in the α range or in out of an α + β range, performed in a temperature range 500°C to 800°C for 2 min to 10 h," as recited in claim 16.

Mardon et al. clearly forms a tube blank before any annealing step (See Col. 2, line 50 and Col. 3, line 35, for example). Mardon et al. thus does not disclose "subjecting *the flat arrangement*, after the β quenching, to a rolling operation performed in a single rolling sequence without intermediate annealing, the rolling performed at a temperature lying in a range ambient to 200°C, with a reduction ratio lying in a range 2% to 20%," as recited in claim 16. Nor is any rolled flat arrangement subjected to an annealing treatment, as also claimed.

The Office Action asserts Mardon et al. is used to teach "the performance of a single rolling sequence without intermediate annealing." It is respectfully submitted that it would not have been obvious to one of skill in the art to combine the APA and the tubes of Mardon et al. Furthermore there is no reason or motivation to modify APA in view of the tubes of Mardon et al. The Office Action asserts "the form of a specimen subjected to cold rolling is immaterial because the crystallographic orientation of a tube (or plate) is prepared for said cold rolling is the same." However, the processes for tubes and flat arrangements are different. One of skill in the art would not use the teaching of tubes such as Mardon et al. to combine with the flat arrangements of APA. It is known by one of skill in the art that the deformation process and annealing textures are more complex with tubes than with sheet arrangements. This is exampled in the American Society for Testing and Materials (ASTM)

technical publication "Deformation Mechanisms, Texture, and Anisotropy in Zirconium and Zircaloy." This publication teaches that "for example, [in] the relatively simple process of sheet rolling, the forces acting during deformation cannot be given precisely. For deformation process such as tube drawing and rocking, the interaction of forces is even more complicated." (See Paragraph 2.3.4). In chapter 3.5 the publication teaches "The annealing textures in tubing appear to be more complex than those of rolled and annealed sheet. In tubing, different features of annealing textures can develop, depending on the relative reductions in wall thickness and diameter, the degree of deformation, the temperature of deformation, and the deformation method before annealing (extruding, rocking, drawing)." (See also "Zirconium Alloy Cold Pilgering Process Control by Modeling"). It is clear from these publications that the shaping of flat products as in the present invention involves a completely different deformation mode than the shaping tubes such as Mardon et al. It is respectfully submitted there is no reason or motivation to combine such different technical specimens.

It is further respectfully submitted that it would not have been obvious to one of skill in the art to combine the references of Mardon et al. with Graham or Katz to achieve the claimed invention in view of the tube shaped structure. There also is no motivation or reason to combine Mardon et al. and Graham or Mardon et al. and Katz with the APA. Although it is known that different configurations are available for nuclear fuel elements, there are different ways to manufacture such pieces. Mardon et al. is a method for manufacturing tubes. Mardon et al.'s teachings are simply not relevant to the APA, regardless of the Graham or Katz teaching which do not address the APA steps. Furthermore, Katz fails to teach the use of alloys with at least 95% of Zr for making fuel elements in Zr-U alloy

As mentioned above, both Mardon et al. and the APA fail to teach or show "a reduction ratio lying in a range 2% to 20%," as recited in claim 16. Mardon et al.'s tubes are drawn into blanks, and this different shaping process would not result in the same structure or in the claimed "reduction ratio" of 2 to 20 percent.

There simply is no teaching or disclosure in any of the prior art of a reduction ratio of 2 and 20 percent for flat arrangements nor has the Office Action cited any references. This is not a mere obvious variant but a substantive claim limitation in the context of a specific claimed rolling operation. On this basis alone, withdrawal of the rejection is respectfully

requested.

Furthermore, the Office Action asserts that the reduction ratio is a design requirement that depends on the final dimensions of the final product. The final product dimensions are only one parameter of a combination of features which define the process and cannot be isolated just because its choice would depend on the final dimensions required for the product.

The Office Action asserts "the applicant recites a wide range for this reduction ratio" and "[t]his is evidence that this ratio either varies depending on the particular application of the final product or is not critical to the claimed invention." (See Office Action page 6). The reduction ratio is given in a range because of structural differences that may occur. However this range is a critical limitation. For example, a reduction ratio above 20% is not considered satisfactory, the reduction ratio should be less in order to ensure good isotropy. (See the specification paragraph [0088]).

With respect to claim 25, claim 25 recites, "a zirconium alloy flat product, obtained by the method:

one of preparing and casting a zirconium alloy ingot containing at least 95% by weight of zirconium, and including impurities and alloying elements;

shaping the ingot in order to obtain a flat arrangement;

subjecting the flat arrangement to a β quenching operation under conditions that are determined to obtain within the flat arrangement an acicular structure at an end of the β quenching;

subjecting the flat arrangement, after the β quenching, to a rolling operation performed in a single rolling sequence without intermediate annealing, the rolling performed at a temperature lying in a range ambient to 200°C, with a reduction ratio lying in a range 2% to 20%; and

subjecting the rolled flat arrangement to an annealing treatment in the α range or in out of an α + β range, performed in a temperature range 500°C to 800°C for 2 min to 10 h."

As discussed above, the APA admittedly does not show the "subjecting the flat arrangement, after the β quenching, to a rolling operation performed in a single rolling sequence without intermediate annealing, the rolling performed at a temperature lying in a

range ambient to 200°C, with a reduction ratio lying in a range 2% to 20%," and "subjecting the rolled flat arrangement to an annealing treatment in the α range or in out of an α + β range, performed in a temperature range 500°C to 800°C for 2 min to 10 h," as recited in claim 25.

Mardon et al. clearly forms a tube blank before any annealing step (See Col. 2, line 50 and Col. 3, line 35, for example). Mardon et al. thus does not disclose "subjecting *the flat arrangement*, after the β quenching, to a rolling operation performed in a single rolling sequence without intermediate annealing, the rolling performed at a temperature lying in a range ambient to 200°C, with a reduction ratio lying in a range 2% to 20%," as recited in claim 25. Nor is any rolled flat arrangement subjected to an annealing treatment, as also claimed.

The Office Action asserts Mardon et al. is used to teach "the performance of a single rolling sequence without intermediate annealing." It is respectfully submitted that it would not have been obvious to one of skill in the art to combine the APA and the tubes of Mardon et al. Furthermore there is no reason or motivation to modify APA in view of the tubes of Mardon et al. The Office Action asserts "the form of a specimen subjected to cold rolling is immaterial because the crystallographic orientation of a tube (or plate) is prepared for said cold rolling is the same." The processes for tubes and flat arrangements are different. One of skill in the art would not use the teaching of tubes such as Mardon et al. to combine with the flat arrangements of APA. It is known by one of skill in the art that the deformation process and annealing textures are more complex with tubes than with sheet arrangements. This is exampled in the American Society for Testing and Materials (ASTM) technical publication "Deformation Mechanisms, Texture, and Anisotropy in Zirconium and Zircaloy." This publication teaches that "for example, [in] the relatively simple process of sheet rolling, the forces acting during deformation cannot be given precisely. For deformation process such as tube drawing and rocking, the interaction of forces is even more complicated." (See Paragraph 2.3.4). In chapter 3.5 the publication teaches "The annealing textures in tubing appear to be more complex than those of rolled and annealed sheet. In tubing, different features of annealing textures can develop, depending on the relative reductions in wall thickness and diameter, the degree of deformation, the temperature of deformation, and the deformation method before annealing (extruding, rocking, drawing)." (See also "Zirconium

Alloy Cold Pilgering Process Control by Modeling"). It is clear from these publications that the shaping of flat products as in the present invention involves a completely different deformation mode than the shaping of long products into tubes such as Mardon et al. It is respectfully submitted that there is no reason or motivation to combine such different technical specimens.

It is further respectfully submitted that it would not have been obvious to one of skill in the art to combine the references of Mardon et al. with Graham or Katz to achieve the claimed invention in view of the tube shaped structure. There also is no motivation or reason to combine Mardon et al. and Graham or Mardon et al. and Katz with the APA. Although it is known that different configurations are available for nuclear fuel elements, there are different ways to manufacture such pieces. Mardon et al. is a method for manufacturing tubes. Mardon et al.'s teachings are simply not relevant to the APA, regardless of the Graham or Katz teaching which do not address the APA steps. Furthermore, Katz fails to teach the use of alloys with at least 95% of Zr for making fuel elements in Zr-U alloy

As mentioned above, both Mardon et al. and the APA fail to teach or show "a reduction ratio lying in a range 2% to 20%," as recited in claim 25. Mardon et al.'s tubes are drawn into blanks, and this different shaping process would not result in the same structure or in the claimed "reduction ratio" of 2 to 20 percent.

There simply is no teaching or disclosure in any of the prior art of a reduction ratio of 2 and 20 percent for flat arrangements nor has the Office Action cited any references. This is not a mere obvious variant but a substantive claim limitation in the context of a specific claimed rolling operation. On this basis alone, withdrawal of the rejection is respectfully requested.

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The Office Action asserts "the applicant recites a wide range for this reduction ratio" and "[t]his is evidence that this ratio either varies depending on the particular application of the final product or is not critical to the claimed invention." (See Office Action page 6). The

reduction ratio is given in a range because of structural differences that may occur. However this range is a critical limitation. For example, a reduction ratio above 20% is not considered satisfactory, the reduction ratio should be less in order to ensure good isotropy. (See the specification paragraph [0088]).

Withdrawal of the rejection of independent claims 16 and 25 and dependent claims 18, 22 to 24 and 26 under 35 U.S.C. §103(a) is respectfully requested.

CONCLUSION

It is respectfully submitted that the application is in condition for allowance and applicants respectfully request such action.

If any additional fees are deemed to be due at this time, the Assistant Commissioner is authorized to charge payment of the same to Deposit Account No. 50-0552.

Respectfully submitted,

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By:_____

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